SEMICLASSICAL MEASURES FOR COMMUTING QUANTUM CAT MAPS

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Abstract

Quantum ergodicity theorems state that given a orthonormal basis of Laplace eigenfunctions on a compact Riemannian manifold with ergodic geodesic flow, most of the eigenfunctions become equidistributed in the large eigenvalue limit. Rudnick and Sarnak conjectured that, on negatively curved manifolds, all (and not only most) eigenfunctions must equidistribute. In contrast, for quantum cat maps on the torus, Faure, Nonnenmacher, and De Bièvre constructed sequences of eigenfunctions that fail to equidistribute, yielding so-called semiclassical measures. To rule out such non-equilibrium semiclassical measures, one imposes additional symmetries on the eigenfunctions, e.g. using Hecke operators, leading to arithmetic quantum unique ergodicity theorems by Lindenstrauss and others. In this talk, I will present, in the setting of higher-dimensional quantum cat maps, a method to define commuting operators yielding semiclassical measures with equilibrium component at least $1/2$ with the remainder having zero entropy.